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MINE SIGNBOARDS

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MINE SIGNBOARDS.

By Edwin Higgins and Edward Steidle.

INTRODUCTION.

The Bureau of Mines publishes this paper with a view to increasing safety in mining operations. The purpose of the paper is to draw attention to the need of signboards in the underground workings of mines, and to suggest a set of universal symbols for adoption throughout the mining districts of the United States.

As indicating the natural tendency of man to utilize signs and signboards of various kinds, it seems desirable, before discussing the subject in its relation to mines, to point out some of the uses to which such devices have been put in the past. The use of symbols and signs antedates history. The Egyptians thousands of years ago employed hieroglyphics and crude sketches of animals and birds in the development of a sign language. Such systems were continued for centuries by various nations of early days. The aboriginal tribes of the American Continent used a sign language. Many pioneers in their journeys through the wilderness gained valuable information regarding the country through crude markings on prominent trees or rocks along a trail.

After the development of written languages, the use of signboards for various purposes became universal. In recent times their use has developed rapidly in every civilized country on the globe. In Germany especially, in addition to the signboards employed by industrial institutions, there appear on every hand admonitions, directions, and laws, printed on placards or boards and displayed in prominent public places.

Electrical signs are now widely used. In the larger cities all over the world vast sums of money are spent in advertising by means of electrical displays. Direction signs are found in railway stations and in public buildings.

It is a universal custom to place warning signs at railroad crossings, dangerous excavations, and at all places that present danger to the traveling public. In short, there are few conditions in the affairs of civilized man that do not embrace, in some form, the use of the signboard.

THE USE OF SIGNBOARDS IN MINES.

The value of warning signs for protecting the general public against dangerous conditions in all walks of life is attested by their general adoption. If warnings of danger are necessary at railroad crossings, excavations, or surface caves (fig. 1), powder magazines (fig. 2), in and around electrical plants (fig. 3), in power houses, and many other places on the surface where man has the benefit of the light of day, it appears that there is all the more necessity for warnings in the underground workings of mines where there is little or no light.

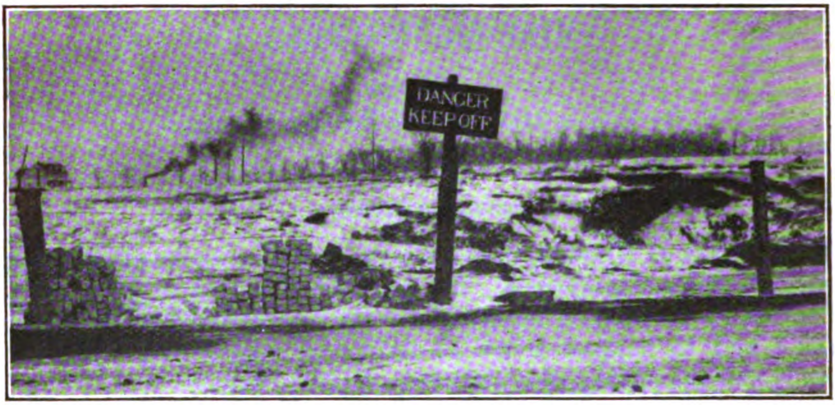

FIGURE 1.—Danger sign near surface cave.

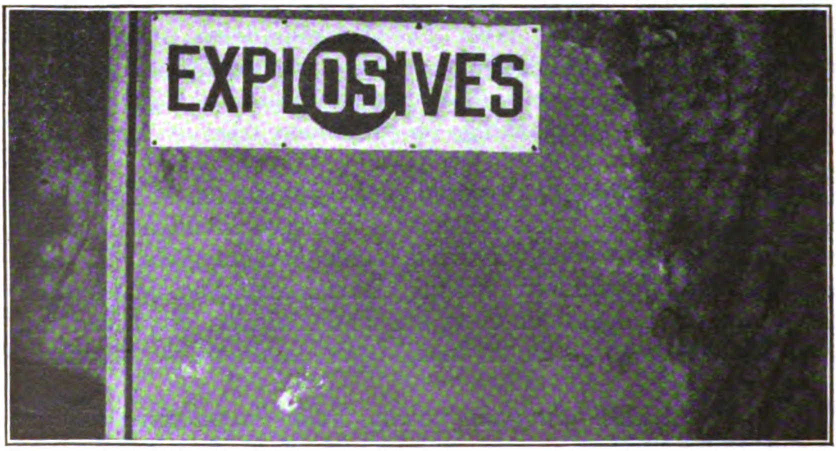

FIGURE 2.—Danger sign at entrance to powder magazine in a Lake Superior mine.

A miner is much less likely to approach a powder magazine with an open light or a lighted pipe in his hand if he is advised by a sign that powder is stored near by, and usually he will be more careful in approaching any point where a danger sign is displayed. Under

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ordinary conditions, if the miner is unfamiliar with the underground workings he will be benefited and will save time if he is enabled to consult a sign that shows him where he is or indicates the way to some certain point. In all large mines there are at all times many new employees who need the guidance offered by the signboard, as do even old employees in a new part of the mine. Signs pointing the way of escape to different levels, shafts (fig. 4), or other openings are especially valuable in times of disaster, such as fires, floods, explosions, or the caving of ground.

Many mine officials, foremen, or bosses who have spent years at a single mine do not see readily the necessity for mine signboards; because they are entirely familiar with the mine workings it does not occur to them that the average miner can not in a short time acquire the same familiarity with conditions. In the United States to-day both the metal and the coal miners are largely of a roving disposition. Many of them are foreigners who are more or less ignorant of English. As a class they require guidance in the matter of protecting themselves from accidental injury.

Mine signboards are in use in many mining districts of the United States. Although in no part of the country has the practice become general, there are isolated mines that have worked out an elaborate system of signboards. There has been no concerted action looking to the adoption of certain universal symbols or signs, although there are manufacturers of signs and some local mining organizations now working toward this end.

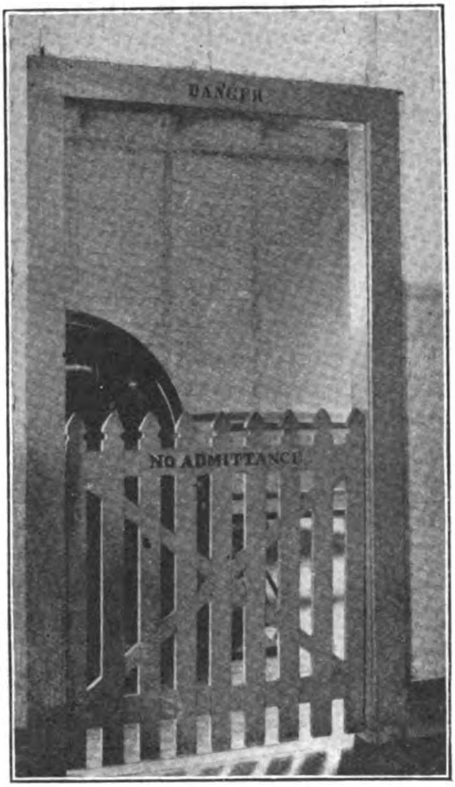

FIGURE 3.—Danger signs at door of dynamo room.

RECOMMENDATIONS FOR UNIVERSAL SYMBOLS FOR MINE SIGNBOARDS.

In considering symbols for universal use it becomes apparent at once that devices or emblems can not be provided to meet all the requirements of a complete system of mine signboards. In order that the symbols may be understood readily by men of all nationalities it is desirable that the signboards contain as little writing as possible. Although there are many symbols or emblems that may be suggestive of certain conditions in and about mines, it is perhaps better not to attempt to adopt a too extensive system of universal signboards, for such an attempt would result in confusion. The most important requirements to which the authors feel immediate attention should be given are universal symbols (Pl. I) denoting: (1) Danger, (2) direction to safety, and (3) ladderways. In the course of time, when miners have become familiar with these signs, the system may be developed by various combinations of the three symbols adopted and by the addition of others.

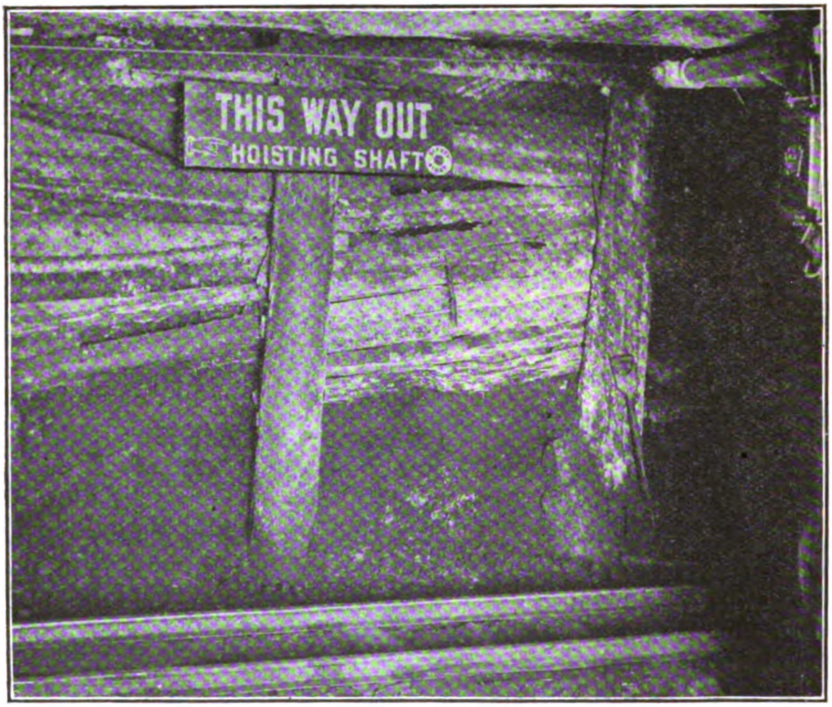

Figure 4.—Signboard in a Lake Superior iron mine.

UNIVERSAL SYMBOL OF DANGER.

Red is the color in general use to indicate danger, and there appears to be no good reason why this color should not be used in mining. It is recommended that a circle filled in solidly with red, making a red ball, and painted on a white background be adopted as the universal symbol of danger.

This symbol is already in use as a danger sign in many of the metal mines in this country. Used without words, it may be em-

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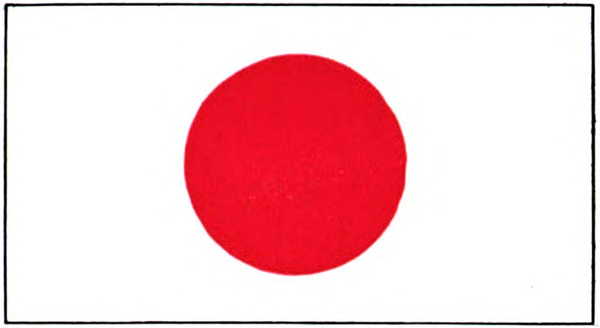
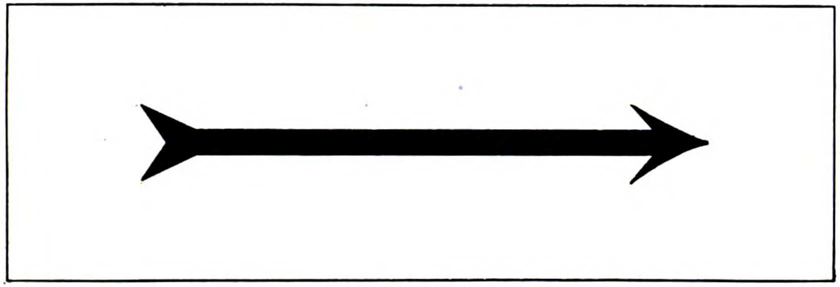
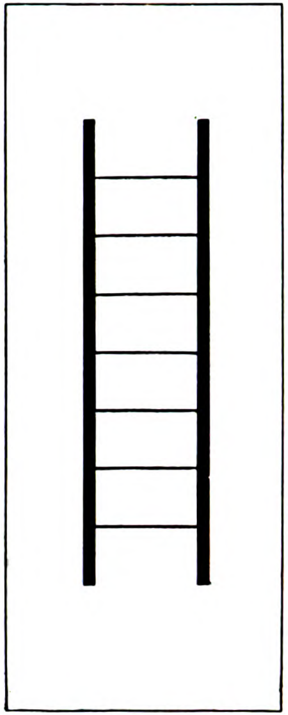


A. UNIVERSAL SYMBOL FOR DANGER.



B. UNIVERSAL SYMBOL FOR INDICATING DIRECTION TO SAFETY.



C. UNIVERSAL SYMBOL FOR LADDERWAY OR STAIRWAY.

ployed either on surface or underground to give warning of danger of almost any kind. The great advantage of such a symbol is that it will be understood by every man no matter what his nationality, and this can not be said of any sign that bears even one written word.

It may be remarked that such a sign may not be definite enough and that by its use a company or individual might be held responsible for an accident on the ground that proper warning had not been provided. However, the universal adoption of this symbol would soon make it as familiar as other widely-known devices, such as the red cross of the American National Red Cross. Under such conditions it would be regarded by fair-thinking men, judges, or juries as a sufficient warning of danger.

Although this symbol, without words, may be used to advantage at nearly all points where danger exists, yet under certain conditions some wording will be required to make the danger symbol effective. However, the red ball should be supplemented by wording only when words are absolutely necessary, and the words used should be simple and concise. As examples of the use of this danger sign coupled with words of warning the following are suggestive: For posting powder magazines the symbol may be accompanied by the words "Explosives" (see fig. 2), "Powder Magazine," or "Danger, Powder Stored Here"; for posting places in power plant, or at points on surface or underground where there is danger of contact with high-voltage wires, such wording as the following may be used: "Danger, Do Not Throw This Switch," "Danger, Look Out For Trolley," or "Danger, Live Wire." For posting a place where a misfire has occurred use the words "Misfired Holes, Keep Away." It is often desirable to call attention to the direction in which the danger exists. In such cases words may be used, or a hand or other device may point toward the danger, whether it be overhead, underfoot, or straight ahead. For reasons that will appear in the following paragraph an arrow should not be used for pointing toward the danger.

UNIVERSAL SYMBOL OF SAFETY.

It is recommended that the universal symbol for indicating the direction to safety be an arrow, painted or, in case of emergency, chalked on either a light or dark background, and without wording, the idea being to make the arrow the symbol of safety, so that it will convey this meaning however it may be made or placed. For special purposes this symbol may be used also in connection with such wording as follows: "To 2nd Outlet Shaft," "To Main Drift," or "To Main Crosscut."

UNIVERSAL SYMBOL INDICATING LADDERWAYS.

It is recommended that the universal symbol for indicating ladderways or stairways (required for coal mines by some States) be a ladder, preferably painted in any dark color upon a light-colored background. This symbol may be used without words to indicate a ladderway, or it may be accompanied by such words at the top as the following: "To 20th Level," "To Surface." In case of ladderways leading downward the wording at the bottom might be "To 19th Level," "To Sump."

GENERAL USE OF MINE SIGNBOARDS.

In addition to the universal symbols suggested herein there are many other useful signboards that should be used in and about the mines. However, owing to the difference in conditions prevailing in the various classes of mines, there is no one set of signboards that would be applicable to all mines. The selection will depend on the type of the mine and, to a certain degree, on the class of miners employed. If the men are practically all English-speaking the problem is somewhat simplified. If, as is the case in some districts, the miners are of anywhere from 6 to 10 nationalities, obviously it will be necessary to depend as much as possible on symbols and the simplest of words.

In very deep mines, such as those of the Lake Superior copper district, special attention should be devoted to signs for the different stations designating the number of the level. In mines where the workings extend over a great horizontal area, as in certain disseminated copper deposits of the southwestern part of the United States, in the iron mines of the Lake Superior district, and in most coal mines, more attention should be paid to signs that indicate the way to main drifts, crosscuts, slopes, and shafts. In all types of mines the most important step is to post powder magazines and dangerous conditions of any nature whatsoever.

A careful consideration of conditions existing in and about a mine will enable the responsible official to provide a set of signboards that will be adequate. As an aid in the selection of an adequate system the following list of signboards that have been noted at mines in various parts of the country is submitted:

SIGNBOARDS FOR POINTS ON THE SURFACE.

"Danger; Keep Away." (Around the boundary of surface caves.)
"Do Not Walk On These Tracks."
"Danger; Keep Away From Shaft Collar."
"No Smoking Allowed Around Shaft Collar."
"Lighted Candles or Lamps Not Allowed on Man Cage."
"Look Up." (Under trestle or tipple where rock, ore, or coal is handled.)
"Keep Out."
"Careless Workmen Not Wanted Here." (On office.)

"No Admittance Without Permission From Office."
"Live Wire."
"High Voltage. Do Not Touch."
"Safety First."
"Riding on Ore Skip Positively Prohibited."
"Riding on Incline Forbidden."

SIGNBOARDS FOR SHAFT STATIONS.

A placard showing complete code of hoisting signals.

"Do Not Ring to Move Cage or Skip When Men Are Working in Shaft or Sump."

"Not More Than — Men Permitted to Ride in Cage."

"Cage Doors Must Be Closed When Men Are Being Handled."

"No Loafing Around This Station."

"Throw All Rubbish Here" (at entrance to small opening off station).

"Miners Not Permitted to Ride on Motor."

"Look Where You Are Going—This Means You."

"Wrestling, Pushing, or Crowding Positively Prohibited."

"Safety First."

"2,000 Level" or "2,500 Level."

"Look Out for the Motors" (locomotives).

SIGNBOARDS FOR PUMP STATIONS.

"Keep Oily Waste in Receptacle Provided."
"Do Not Oil the Timber—Oil the Machinery."
"Do Not Hang Candles or Lamps on Timber."
"Keep This Place Clear of All Rubbish."
"Beware—Live Wire."
"High Voltage—Do Not Touch."

SIGNBOARDS FOR MINE WORKINGS.

"To 2nd Outlet Shaft" (with arrow or hand pointing).

"Ladderway to 12th Level."

"To Main Shaft" (with arrow pointing).

"To Timber Shaft" (with arrow pointing).

"Dangerous Ground—Keep Away."

"Danger Overhead."

"Look Out for Trolley Wire." (At points where timber carrying the trolley wire is sagging, it is assumed that the wire has guard boards wherever men are likely to come in contact with it.)

"Look Out for Motors."

"Danger—Dynamite Stored Here."

"Powder Magazine."

"Danger—Blasting Here."

"Danger Ahead—Old Workings."

"Ladderway to Surface."

"No Smoking Allowed."

"Danger from Ore Trains—No Traveling in This Tunnel" (or drift).

"No Candles or Lamps Allowed in Magazine."

"No Candles or Lamps Allowed in Stables."

At entrance to a gaseous mine or district, "Open Lamps, Pipes, Cigars, Cigarettes, or Matches Must Not Be Taken Into This Mine" (or district).

SIZE, CONSTRUCTION, AND LETTERING OF SIGNBOARDS.

The proper size of a signboard will depend largely upon the position in which it is to be placed. Obviously, signboards that must be read from a distance should be larger, in size and lettering, than those to be read at close range. For general use underground signboards should be about 3 feet long and 1 foot wide. In close places, however, it would be advisable to make them smaller. They may be made of wood alone, wood covered with sheet tin, iron, or copper, or of solid sheet copper or steel. The background may be painted white. However, white enamel finish is better, as it may be more readily cleansed. The lettering may be in black. Stencils for letters or complete sign patterns may be made with little trouble from stiff cardboard. Tin or copper stencils are more expensive, but they will last a long time. Stencils and enameled steel signboards are procurable at small cost from various manufacturing companies. An excellent signboard is made of rolled steel and has the colors of the background and lettering fused.

CONCLUSION.

The writers desire to urge in the strongest terms the thorough posting of mines with signboards, and especially the adoption of the three universal symbols suggested herein. There appears to be no reason why these symbols can not be used in every mining district in the United States. At some time there must be concerted action in the matter of the adoption of universal symbols; if the question is left open for indefinite consideration years may pass before anything satisfactory to everybody is selected. Why not, as a beginning, adopt these three symbols? They will serve as a foundation upon which to build.

Those mine officials who have not given this matter serious consideration and those who do not believe in mine signboards as safety devices may by studying their accident records find more than one instance of a man who might have escaped injury had a sign warned

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him of danger. Of course, men are hurt in spite of warnings, but, on the other hand, many men daily are saved from injury by the presence of warning signs. It may seem that a man who crawls under a danger sign into a raise or other excavation and is killed in consequence must be either insane or a suicide, and yet such accidents happen at times. The sight of a signboard, whether the miner reads it or not, serves as a suggestion that he must be careful. The average miner requires guidance and education in safety precautions. Many safety experts believe that it is important to remind the workman, continually, by every conceivable means, of the precautions he should take. The mine signboard plays a most important part in such educational work. It may be added in connection with the use of mine signboards that many mining companies have had to pay heavy damages for injuries to workmen at points where no warning of danger was provided, and that the absence of a danger sign was the point on which the attorneys for the plaintiff laid great stress.

PUBLICATIONS ON MINE ACCIDENTS AND METHODS OF MINING.

The following Bureau of Mines publications may be obtained free by applying to the Director Bureau of Mines, Washington, D. C.:

BULLETIN 10. The use of permissible explosives, by J. J. Rutledge and Clarence Hall. 1912. 34 pp., 5 pls., 4 figs.

BULLETIN 17. A primer on explosives for coal miners, by C. E. Munroe and Clarence Hall. 61 pp., 10 pls., 12 figs. Reprint of United States Geological Survey Bulletin 423.

BULLETIN 20. The explosibility of coal dust, by G. S. Rice, with chapters by J. C. W. Frazer, Axel Larsen, Frank Haas, and Carl Scholz. 204 pp., 14 pls., 26 figs. Reprint of United States Geological Survey Bulletin 425.

BULLETIN 42. The sampling and examination of mine gases and natural gas, by G. A. Burrell and F. M. Seibert. 1913. 106 pp., 2 pls., 23 figs.

BULLETIN 46. An investigation of explosion-proof mine motors, by H. H. Clark. 1912. 44 pp., 6 pls., 14 figs.

BULLETIN 48. The selection of explosives used in engineering and mining operations, by Clarence Hall and S. P. Howell. 1913. 50 pp., 3 pls., 7 figs.

BULLETIN 52. Ignition of mine gases by the filaments of incandescent electric lamps, by H. H. Clark and L. C. Ilsley. 1913. 31 pp., 6 pls., 2 figs.

BULLETIN 56. First series of coal-dust explosion tests in the experimental mine, by G. S. Rice, L. M. Jones, J. K. Clement, and W. L. Egy. 1913. 115 pp., 12 pls., 28 figs.

BULLETIN 62. National mine-rescue and first-aid conference, Pittsburgh, Pa., September 23–26, 1912, by H. M. Wilson. 1913. 74 pp.

BULLETIN 65. Oil and gas wells through workable coal beds; papers and discussions, by G. S. Rice, O. P. Hood, and others. 1913. 101 p., 1 pl., 11 figs.

BULLETIN 69. Coal-mine accidents in the United States and foreign countries, compiled by F. W. Horton. 1913. 101 pp., 3 pls., 40 figs.

TECHNICAL PAPER 4. The electrical section of the Bureau of Mines, its purpose and equipment, by H. H. Clark. 1911. 12 pp.

TECHNICAL PAPER 7. Investigations of fuse and miners' squibs, by Clarence Hall and S. P. Howell. 1912. 19 pp.

TECHNICAL PAPER 11. The use of mice and birds for detecting carbon monoxide after mine fires and explosions, by G. A. Burrell. 1912. 15 pp.

TECHNICAL PAPER 13. Gas analysis as an aid in fighting mine fires, by G. A. Burrell and F. M. Seibert. 1912. 16 pp., 1 fig.

TECHNICAL PAPER 14. Apparatus for gas-analysis laboratories at coal mines, by G. A. Burrell and F. M. Seibert. 1913. 24 pp., 7 figs.

TECHNICAL PAPER 17. The effect of stemming on the efficiency of explosives, by W. O. Snelling and Clarence Hall. 1912. 20 pp., 11 figs.

TECHNICAL PAPER 18. Magazines and thaw houses for explosives, by Clarence Hall and S. P. Howell. 1912. 34 pp., 1 pl., 5 figs.

TECHNICAL PAPER 19. The factor of safety in mine electrical installations, by H. H. Clark. 1912. 14 pp.

TECHNICAL PAPER 21. The prevention of mine explosions, report and recommendations, by Victor Watteyne, Carl Meissner, and Arthur Desborough. 12 pp. Reprint of United States Geological Survey Bulletin 369.

TECHNICAL PAPER 22. Electrical symbols for mine maps, by H. H. Clark.

TECHNICAL PAPER 23. Ignition of mine gas by miniature electric lamps, by H. H. Clark. 1912. 5 pp.

TECHNICAL PAPER 24. Mine fires, a preliminary study, by G. S. Rice. 1912. 51 pp., 1 fig.

TECHNICAL PAPER 28. Ignition of mine gas by standard incandescent lamps, by H. H. Clark. 1912. 6 pp.

TECHNICAL PAPER 30. Mine-accident prevention at Lake Superior iron mines, by D. E. Woodbridge. 1913. 38 pp., 8 figs.

TECHNICAL PAPER 39. The inflammable gases in mine air, by G. A. Burrell and F. M. Seibert. 1913. 24 pp., 2 figs.

TECHNICAL PAPER 40. Metal-mine accidents in the United States during the calendar year 1911, compiled by A. H. Fay. 1913. 54 pp.

TECHNICAL PAPER 43. The influence of inert gases on inflammable gaseous mixtures, by J. K. Clement. 1913. 24 pp., 1 pl., 8 figs.

TECHNICAL PAPER 44. Safety electric switches for mines, by H. H. Clark. 1913. 8 pp.

TECHNICAL PAPER 46. Quarry accidents in the United States during the calendar year 1911, compiled by A. H. Fay. 1913. 32 pp.

TECHNICAL PAPER 47. Portable electric mine lamps, by H. H. Clark. 1913. 13 pp.

TECHNICAL PAPER 59. Fires in the Lake Superior iron mines, by Edwin Higgins. 1913. 34 pp., 2 pls.

MINERS' CIRCULAR 3. Coal-dust explosions, by G. S. Rice. 1911. 22 pp.

MINERS' CIRCULAR 4. The use and care of mine-rescue breathing apparatus, by J. W. Paul. 1911. 24 pp., 5 figs.

MINERS' CIRCULAR 5. Electrical accidents in mines, their causes and prevention, by H. H. Clark, W. D. Roberts, L. C. Ilsley, and H. F. Randolph. 1911. 10 pp., 3 pls.

MINERS' CIRCULAR 6. Permissible explosives tested prior to January 1, 1912, and precautions to be taken in their use, by Clarence Hall. 1912. 20 pp.

MINERS' CIRCULAR 7. The use and misuse of explosives in coal mining, by J. J. Rutledge. 1913. 52 pp., 8 figs.

MINERS' CIRCULAR 9. Accidents from falls of roof and coal, by G. S. Rice. 1912. 16 pp.

MINERS' CIRCULAR 10. Mine fires and how to fight them, by J. W. Paul. 1912. 14 pp.

MINERS' CIRCULAR 11. Accidents from mine cars and locomotives, by L. M. Jones. 1912. 16 pp.

MINERS' CIRCULAR 12. The use and care of miners' safety lamps, by J. W. Paul. 1913. 16 pp., 4 figs.

MINERS' CIRCULAR 13. Safety in tunneling, by D. W. Brunton and J. A. Davis. 1913. 19 pp.

MINERS' CIRCULAR 15. Rules for mine-rescue and first-aid field contests, by J. W. Paul. 1913. 12 pp.

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